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USSR Report

ENERGY

(FOUO 10/82)

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ELECTRIC POWER

SOCIALIST OBLIGATIONS FOR 1982, 11TH FIVE YEAR PLAN

Moscow ELEKTRICHESKIYE STANTSII in Russian No 5, May 82 pp 2-7

[Article: Socialist Obligations of Workers, Engineers, Technicians, Scientists and Employees of the USSR Ministry of Electric Power and Electrification [Minenergo] Enterprises and Organizations on the 1982 Plan for Economic and Social Development and the 11th Five-Year Plan as a whole Ahead of Schedule"]

[Text] To implement the historical decisions of the 26th party congress on the further development of the country's power and electrification on the basis of the wide development of socialist competition, Soviet power workers and power builders are carrying out purposeful work to increase the power potential of the national economy, accelerate development of nuclear power, and create greater efficiency in power and construction production.

During the first year of the 11th Five-Year Plan period power workers provided the national economy with electrical and thermal energy which were within the established limits. The electric power output was 1223.3 billion kilowatt-hours, or 100.4% of the plan. Some 886.3 million gigacalories of heat energy were supplied, or 100.8% of the plan. A reduction in unit fuel consumption was achieved and saved about 1 million tons of conventional fuel. Some 100 million rubles of profit above the plan were obtained due to a reduction in the cost of production.

In addition to the annual programs, 100 million rubles worth of products were manufactured at the plants of this industrial sector, including 1.3 million rubles worth of consumer goods.

The installed capacity of all electric power plants reached 277 million kilowatts, including that of nuclear power plants -- 15 million kilowatts. The peaceful atom works successfully at the Leningradskaya, Chernobyl'skaya, Kurskaya, Kol'skaya, Armyanskaya and other AES. The rated capacity of the largest power unit in the world with a fast neutron 600,000 kilowatt reactor at the Beloyarskaya AES was assimilated. A superpower 1150 kilovolt Ekibastuz-Ural VL [Overhead Line] is being built.

In 1981, new capacities were released for operation at the Kol'skaya, Kovenskaya and Chernobyl'skaya AES; at the Stavropol'skaya, Syrdar'inskaya and Maryyskaya GRES; and at the Sayno-Shushenskaya, Nizhnekamskaya and Cheboksarskaya GES. The first units produced current at the Dnestrovskaya and Kurpsayakaya GES, the

Azerbaydzhanskaya GRES and the Yuzhnaya TETS in Moscow and Leningrad. The following were put in operation: the Nadezhdinskiy Mining-Metallurgical Plant; the second stage of Kamaz [Kama Motor Vehicle Plant]; new capacities at the Volga Pipe Plant; the next in turn unit for producing 450,000 tons of ammonia at the Togliatti Plant; four buildings with a total area of 238,000 square meters at the Atommash Plant; and a number of other facilities.

Construction rates of large electric power plants which use coal from the Ekibastuz and Kansko-Achinsk deposits and the natural and by-product gases of Tyumenskaya Oblast are being increased. Four 500,000 kilowatt units operate at the Ekibastuzskaya GRES and a thirteenth 210,000 kilowatt power unit was placed in operation at the Surgutskaya GRES.

Considerable work was done on the socialist development of collectives. To improve housing and cultural and personal living conditions of the workers in this industrial sector, 2,089,000 square meters of housing area were built. The following were placed in operation: general educational schools for 8800 students; childrens' combines with 7900 places; hospitals with 320 beds; trade schools for 1440 students; dining rooms with seating capacities of 11,900; and stores with areas of 7500 square meters.

Some 134,000 new workers were trained in various courses in the brigade methods; some 450,000 workers and 120,000 engineers and technicians increased their skills and acquired related trades.

The leading collectives of the Krasnoyarskaya and Nurekskaya GES; the Kostromskaya, Reftinskaya, Konakovskaya and Lukoml'skaya GRES; the Azenergostroy Trust; the Moscow "Elektroshchit" Plant; the Dneproenergostroyindustria Production Association and others have fulfilled their 1981 socialist obligations ahead of schedule.

For selfless labor and for achieving high indicators in socialist competition, the following collectives of builders and operating workers received congratulations from Comrade L. I. Brezhnev, General Secretary of the CPSU Central Committee and Chairman of the USSR Presidium of the Supreme Soviet: the Reftinskaya and Kostromskaya GRES; the Ust'-Ilimskaya GES; the Ust'-Ilimskay LPK [Lumber Industry Complex]; the Cheboksarskaya GES; the Surgutskaya GRES; the KamAZ; the Rovenskaya AES; the Togliatti Nitrogen Plant; the Arpa-Sevan Tunnel; the Kurpsayskaya GES and others.

At the same time, individual collectives and the ministry as a whole have fulfilled neither the tasks for the first year of the 11th Five-Year Plan nor the socialist obligations on reducing unit fuel consumption, introducing power capacities, facilities for social, cultural and personal service purposes, and increasing the productivity of labor.

In 1981, there was further development in socialist competition of collectives on the principle of working relay races and the experience of 28 Leningrad enterprises and organizations that are building the Sayano-Shushenskaya GES, competition of workers of leading trades working on personal economic accounts, and for delivering repaired equipment according to guarantee certificates.

The collective of the Gidroproyekt Institute, whose initiative was approved by the CPSU Central Committee, came forward with a valuable initiative in socialist competition. The basis of this initiative is directed toward raising the scientific-techical standard of planning and reducing the estimated cost of building facilities and saving labor and material resources.

By multiplying the glorious traditions of competition, creating in each labor collective a situation for the creative search for new reserves, workers in this industrial sector are getting ready to meet the 60th anniversary of the formation of the USSR with honor.

Dozens of thousands of leading workers and production innovators, many collectives of electric power plants, networks, plants and new constructions in the industry, following the patriotic example of the comprehensive brigade of the Neryunginskiy GRES construction Administration, Hero of Socialist Labor and deputy of the USSR Supreme Soviet A. B. Novolodskiy, power builders of Zaporozhskaya AES and power workers of the Konakovskaya GRES, stood the shock watch under the slogan, "To the 60th Anniversary of the formation of the USSR -- 60 shock weeks."

Guided by the decree of the November (1981) Plenum of the CPSU Central Committee, the directions of Comrade L. I. Brezhnev, General Secretary of the CPSU Central Committee and Chairman of the USSR Presidium of the Supreme Soviet, and the decree of the CPSU Central Committee "On the 60th anniversary of the formation of the USSR," workers, engineers, technicians, scientists and employees of this industrial sector are assuming the following obligations.

I. For the 11th Five-Year Plan Period

Increase the output of electrical power of the USSR Minenergo to 1428 billion kilowatt-hours by the end of the five-year plan period.

Increase the annual volume of commercial output to 25.1 billion rubles by 1985 which is 4.1 billion rubles more than in 1980, and provide an increase in industrial activity in a sum greater than 900 million rubles.

Reduce organic fuel consumption by not less than 75 million tons by increasing the share of electric power output at nuclear and hydroelectric power plants, and by reducing unit fuel consumption and the amount of electric power used for fuel transport.

Place additional capacities in operation at the Zagorskaya and Kayshyadorskaya GAES in order to raise the efficient utilization and improve the operating mode of nuclear electrical power plants. Increase the number of hours utilizing the installed capacity at the AES to 6500 hours.

Increase the output-capital ratio in construction by improving the utilization of contruction machines and devices by 1%.

Increase the equipment servicing coefficient at electric power plants by not less than 9.6% as compared to 1980 which is equivalent to freeing 34,000 persons.

Provide a 90% increase in construction-installation work and a 90% increase in commercial output by increasing the productivity of labor.

Overfulfill the volume of construction-installation work during the five-year plan period on electric power facilities, and place in operation not less than 61 million kilowatts of new power capacities, including power capacities of not less than 18 million kilowatts at nuclear electrical power plants. Complete the installation of 1000 megawatt power unit No 5 at the Chernobyl'skaya AES above the plan by 1985.

Reach the rated capacity of 4 million kilowatts at Ekibastuzskaya GRES-1 in 1983 and complete, by the end of the five-year plan period, three power units of 500,000 kilowatts each at Ekibastuzskaya GRES-2 and two power units of 800 megawatts each at the Surgutskaya GRES-2.

Put in operation two power units of 800 megawatts each at the Berezovskaya GRES-1 in 1984 and 1985.

Put in operation the 1150 kilovolts Ekibastuz-Kustanay overhead line ahead of schedule by one quarter (in the third quarter instead of the fourth quarter of of 1983).

In accordance with the USSR Minenergo construction list, build in 1981-1982 not less than 600,000 kilometers of 0.4-110 kilovolt rural electrical power transmission lines, making it possible to increase electrical power consumption in agricultural production and in everyday servicing of the rural population by 1.4 times, and increase the reliability of the power supply.

Build housing with a total area of not less than 10 million square meters or 2 million square meters more than the five-year plan goal.

Obtain a real national economic effect of 1440 million rubles from introducing scientific and project developments in the five-year plan period.

Increase economic effectiveness by introducing into production scientific research in the area of power in 1985 to not less than 4 rubles 50 kopecks per ruble investment.

The work of the Gidroproyekt Institute imeni S. Ya. Zhuk on raising the scientific technical standards of projects and, on that basis, reducing the estimated cost of facilities and saving labor and material resources should be disseminated widely in the institutes of this industrial sector and will provide the following:

a reduction in power construction costs by 192 million rubles;

a savings of 270,000 tons of metal;

a saving of 380,000 tons of cement;

a reduction in construction labor by 9.2 million man-days.

Save 20,000 tons of metal, 50,000 tons of cement and 30,000 cubic meters of lumber above the plan goal.

Introduce inventions and innovator proposals in the ministry as a whole with an economic effect above 1 billion rubles.

Solve basically the problem of providing for requirements of workers in this industrial sector of childrens' preschool establishments and activate not less than 51,400 places in these establishments.

Overfulfill plans on producing cultural-personal service and household goods for the people in the five-year plan period to an amount of 1.3 million rubles.

II. For 1982

In the Area of Power

On the basis of increasing further the reliability and efficiency of power equipment operation, placing in operation new capacities ahead of schedule, implementing measures on reducing accident rates, carrying out timely repairs of equipment at electric power plants and power networks, providing, within established goals, a reliable supply of electrical and thermal energies to the national economy and the people of the country, producing for that purpose 1259 billion kilowatt-hours of electric power and 885 million gigacalories of thermal energy.

Obtain 25 million rubles of profit above the plan by increasing the efficiency of power production, by reducing production costs of electrical and thermal energy.

Increase the operating level of electric power plants and networks, develop competition between workers of leading trades using personal economic accounting, continue the introduction of advanced experience of the Kostromskaya, Reftinskaya, Konakovskaya, Razdanskaya and Zaporozhskaya GRES and, on that basis, reducing unit fuel consumption from 327.1 to 324.5 grams per kilowatt-hour of electric power supplied, and save 2.3 million tons of conventional fuel by 30 December 1982.

Increase the utilization coefficient of the installed capacity of nuclear electric power stations by 1% as compared to 1981 by introducing measures to improve operation and repair servicing of the equipment. This will make it possible to produce an additional 800 million kilowatt-hours of electrical power. Assimilate the rated capacity of power unit No 3 of the Chernobyl'skaya AES and, due to that, obtain before the end of the year 95 million kilowatt-hours of electrical power ahead of the normal schedule by 20 days.

Increase the equipment servicing coefficient at electrical power plants by 1.6% as compared to 1981 by introducing new equipment, improving the organization of labor, expanding the zones of servicing and combining trades. This corresponds to freeing 5840 persons.

Complete basically by 15 November the annual plan for capital repairs of equipment to insure a reliable electric and thermal energy supply to the national economy during the winter of 1982-1983.

Implement the following organizational-technical measures on the basis of introducing new equipment and repair technology, and increasing the volume of work done by the industrial-plant method:

reduce the idle time of power unit equipment in repairs by an average of 8 hours;

increase the number of excellent evaluations for repaired equipment to 43% and release the remaining part of the units with good evaluations.

Transfer not less than 60% of the repair workers to the brigade form of labor organization as compared to 55% according to the plan for the year.

In the Area of Capital Construction

Fulfill the state plan for contract construction installation work by the 60th anniversary of the formation of the USSR on the basis of the maximum concentration of labor, material and financial resources at priority projects, increase the mobility of construction organizations, improve the engineering preparation for construction, raise the standard of production-technological procurement, and further develop socialist competition on the principle of the working relay race.

Complete before the end of the year at facilities under construction 11,285,000 kilowatts of new power capacities, including 1,500,000 kilowatts ahead of schedule; by the 112th anniversary of V. I. Lenin's birthday -- a 200,000 kilowatt hydraulic unit No 3 at the Kurpsayskaya GES; a 250,000 kilowatt power unit No 2 at Yuzhnaya TETs of Lenenergo a month ahead of schedule (in November instead of December); a 110,000 kilowatt power unit No 1 a month ahead of schedule (in August instead of September) at Smolenskaya TETs-2; by the Day of the Power Worker -- 300,000 kilowatt power unit No 2 at the Azerbaydzhanskaya GRES; 250,000 kilowatt power unit No 8 at the Mosenergo TETs; 190,000 kilowatt hydraulic power unit No 1 at the Shamkhorskaya GES; 200,000 kilowatt hydraulic unit No 4 at the Kurpsayskaya GES.

Put in operating the following boilers ahead of schedule: 420 tons/hour No 6 at Ust'Ilimskaya TETs-3 (in November instead of December); 320 tons/hour No 9 at the Irkutskaya TETs-6 (in October instead of November); 420 tons/hour No 8 at the Mogilevskaya TETs-3 (by the Day of the Power Worker).

Put in operation a month ahead of schedule a 100 gigacalorie /hour water-heating boiler No 3 at Neryungri Yakutskaya ASSR.

Put in operation 34,600 kilometers of 35 kilovolt and higher overhead lines and 36,181,000 kilovolt-ampere transformer capacities including the following: a 500 kilovolt overhead Surgut-Belozernaya line a month ahead of schedule (in May instead of June); a 220 kilovolt Usinsk-Vozey overhead line a month ahead of schedule (in May instead of June); two months ahead of schedule (in July instead of September) -- 750 kilovolt Chernobyl'skaya AES-Vinnitsa overhead line and the 220 kilovolt Imilor substation with a 125,000 kilovolt-ampere No 2 transformer; by the Day of the Power Worker -- the 1150 kilovolt Ekibastuz-Kokchetav overhead line; the 500 kilovolt Svobodnyy-Khabarovsk overhead line; the 330 kilovolt Chernobyl'skaya-Mozyr' overhead line with a 330 kilovolt substation; the 330 kilovolt Ignalinskaya AES-Panevezhis overhead line with a 330 kilovolt substation (section to Utena);

the 220 kilovolt Komsomol'sk-on-Amur-Gorin-Berezovka-Dzhamku overhead line; the 220 kilovolt Zeyskaya GES-Prizeyskaya-Tutaul-Dipkun-Tynda overhead line; the 500 kilovolt Ochakovskaya substation with a 501,000 kilovolt-ampere transformer.

Place in operation ahead of schedule by the DAy of the Power Worker the following industrial facilities: capacities for the production of 18,500 tons of steel pipe at the Volga Pipe Plant; capacities for the production of 20,000 tons of cast iron and 5000 tons of steel castings per year at KamAZ; a line for cross cutting logs with a capacity of 367,000 cubic meters and transporting 800,000 cubic meters per year at the Ust'-Ilimsk Industrial Lumber Complex.

Implement not less than 40% of the annual volume of construction-installation work by the brigade contract method, increasing this volume by 5% as compared to 1981.

Transfer in construction work not less than 73% of the piecework workers to the lump sum wage payment system.

Reduce work time losses and unproductive expenditures of construction labor by 10% as compared to 1981.

Increase further the level of mechanization in construction-installation work to reduce the amount of manual labor. Increase the supply of small scale mechanized tools and modern types of equipment to construction and installation organizations. Provide small scale mechanized tools worth 56 million rubles for this purpose, including 300,000 rubles above the plan; provide 1550 norm-sets of manual and mechanized tools for finishing, roofing and other labor-consuming work which will make it possible to free 2500 workers; introduce at construction sites 35 experimental prototypes of new construction machines, devices, technological lines and mechanization facilities for construction-installation work which will make it possible to save 35,000 man-hours.

Raise the quality of construction-installation work insuring the placing in operation, with good and excellent evaluations, 78% of the industrial facilities, 85% of the electric power transmission lines and substations and 78% of the housing and social, cultural and personal service facilities.

Save 6000 tons of metal, 13,000 tons of cement and 2500 cubic meters of lumber above the set norms for material consumption in construction.

Reduce idle time of railroad cars when unloading and thereby freeing 13,500 cars.

In the Area of Production Industrial Products at Commercial Construction Industry Enterprises

Fulfill the annual plan for the volume of product sales and output of the majority of the most important types of products in the assigned list ahead of schedule by the 60th anniversary of the formation of the USSR.

Overfulfill the annual production plan for the output of consumption goods by 200,000 rubles.

Obtain an 80% increase in output by an increase in the productivity of labor.

Increase the ratio of workers using collective (brigade) forms of the organization of wages at construction industry enterprises to 51%.

Increase the output of the highest category of quality products by 4 million rubles as compared to the plan goal.

Certify for the state emblem of quality 17 types of products including: reinforced concrete square cross section piles; stands of vibrating masts of high voltage lines; electrical gantry cranes; 50/10-ton overhead cranes; the V-401A vibrating pile drivers etc.

Provide timely and complete delivery of auxiliary boiler equipment, machines, devices and construction structures.

Increase complete deliveries up to 90%.

In the Area of Scientific Research, Design and Planning-Exploratory Work

On the basis of increasing the efficiency of utilizing the scientific technical potential, concentrating scientific forces on the solution of especially important national economic problems in the area of power, accelerating the introduction of new equipment and raising the quality of planning:

obtain a real economic effect of 250 million rubles annually from introducing scientific and design developments;

achieve an economic effect from introducing into production scientific investigations in the area of power of not less than 4 rubles per 1 ruble of investment into scientific research work as compared to 3.9 rubles in 1981.

fulfill ahead of schedule by the Day of the Power Worker the annual plan of introducing new equipment in all divisions;

provide the issuance of working documentation for construction-installation work for all priority facilities in 1983 by 25 June.

issue not less than 40% of estimate-planning documentation with excellent documentation during the year.

Develop widely in the institutes of this industrial sector the experience of the Gidproyekt Institute imeni S. Ya. Zhuk on raising the scientific technical level of designs and, on that basis, reducing the estimated cost of facilities, saving labor and material resources and prividing the following:reduce the cost of power construction by 65 million rubles; save 80,000 tons of metal; save 110,000 tons of cement; reduce labor expenditures in construction by 2.5 million man-days.

Reduce the construction cost of the special design 1150 kilovolt Ekibastuz-Ural overhead line by 2.5 million rubles, when developing the working documentation, by introducing new progressive and efficient solutions.

Develop to a high technical level by using the latest achievements of science and technology the following: the design of the 2.0 million kilowatt Odessa ATETs; the design of the 750 kilovolt Zaporozhskaya AES-Zaporozhskaya substation overhead line with 750 kilovolt overhead line entries; the technical design for the Khudoni GES with a special design arched dam 200 meters high, saving 5000 tons of metal as compared to the approved technical substantiation; the arrangement for developing and locating the "Elektroenergetika" facilities to the year 2000 (before 25 September); the design of a 250 megawatt steam-gas installation with an intracycle gasification of fuel for the Novo-Tul'skaya TETs (in creative cooperation with the TsKTI [Central Scientific-Research and Planning-Design Turbine Boiler Institute imeni I. I. Polzunov], VTI [All-Union Thermotechnical Institute imeni F. E. Dzerzhinskiy] and NIOGAZ [Gas Scientific Research Department]), that will make it possible to reduce the amount of harmful discharges into the air and reduce fuel consumption by 5 to 7%.

Introduce inventions and innovator proposals having an economic effect of not less than 225 million rubles.

In the Area of Social Development of Collectives

To raise further the standard of living of the people, create stable collectives, improve labor, everyday and rest conditions of workers, engineers, technicians and employees of the industrial sector by achieving the following:

build and release for operation by the 60th anniversary of the USSR not less than 2,100,000 square meters of housing area in settlements of power workers and power builders;

build at enterprises and construction sites kindergartens for 12,000 places; 520-bed hospitals; polyclinics to handle 2240 visits; schools for 10,000 students; trade schools for 3300 students; 26 stores with an area of 13,500 square meters; 72 dining rooms with 15,900 seats; 14 vegetable-fruit warehouses with capacities of 10,500 tons; nine food depots with areas of 15,400 square meters; two refrigerators with capacities of 3200 tons and three fermentation-pickling centers for 540 tons of products;

fulfill ahead of schedule by 30 December the general plan for goods turnover and the production of internal output of social feeding to enterprises of the Glavurs [Main Administration of Supplies to Workers]. Sell food and industrial goods to workers by 85 million more rubles than in 1981. Increase the level of sales of goods by self-service to 54%;

train 123,800 new workers during the year in courses for raising skills at educational combines, raise the skills, teach second skills to 419,500 workers and 98,000 engineers and technicians.

reduce the turnover of cadres as compared to 1981: by 3.5% in power workers; 3.0% in capital construction, and 1.7% in the commercial construction industry;

improve conditions and increase working conditions for 47,000 workers by reducing noise levels, vibration, dust and gas content at working positions.

On Participation in the Solution of the Food Program

Participate actively in solving the food supply program outlined by the 26th party congress and the November (1981) CPSU Central Committee Plenum for which purpose:

place in operation 102,900 kilometers of 20-6-0.4 kilovolt rural electric power transmission lines by 30 December;

fulfill above the plan work on repairs, and giving organizational technical aid in operating electrical networks and electrical stations belonging to kolkhozes and sovkhozes in an amount of 350,000 rubles;

repair and give organizational technical aid to kolkhozes and sovkhozes (3 million rubles worth) in operating electrical installations of grain conveyors, elevators and field mills used in harvesting the 1982 crop, and animal husbandry farms, complexes and poultry factories to provide wintering of cattle and fowl;

By the start of the harvesting of the crops in 1982, connect to power sources not less than 400 new grain elevators, grain cleaners, vitamin flour machines and other agricultural facilities in oblasts, krays and autonomous republics of the RSFSR.

aid in repairing power equipment of agricultural machines, manufacture mechanization facilities and spare parts in an amount of 500,000 rubles;

fill orders of sovkhozes and kolkhozes for the mechanization of labor-intensive work in an amount of 2 million rubles;

complete the delivery of parts for 7000 silage harvesting combines before 1 December;

by the Day of the Power Worker, fulfill the plan for construction- installation work and agricultural facilities and related industrial sectors in the volume of 76.6 million rubles and assimilate 330,000 rubles above the plan;

produce in auxiliary farms of enterprises and organizations not less than 2900 tons (live weight) of meat, including 950 tons of swine, 2000 tons of milk, 4500 tons of vegetables, 2000 tons of grain and 7600 quintals of live fish.

Put in operation by USSR Constitution Day the following:

a commercial-milk farm for 430 heads in kolkhoz imeni Dzerzhinskiy in Kurskaya Oblast;

a mixed feed plant for 200 tons of mixed feed per day in the Balakovskiy Rayon of Saratovskaya Oblast.

Place in operation by the Day of the Power Worker the following:

capacities for the production of 10,000 tons of cast iron at the Nazarovskiy Plant of Agricultural Machine Building;

a city milk plant (modernization) for producing 30 tons of milk per day at Volzhsk;

a mixed feed plant with a capacity of 630 tons of mixed feed per day at Naberezhnyye Chelny;

the first stage of an animal husbandry combine at Povolzhskiy -- a swine complex for 108,000 head of swine;

a poultry factory with a capacity of 2.6 million fowl per year at Ivanov;

a poultry factory with a capacity of 1 million fowl per year at the Reftinskaya Settlement in Sverdlovskaya Oblast;

a warm water fishery plant at the Verkhne-Tagil'skaya GRES with a breeding area of 2020 square meters for the production of 50 million baby carp and 1350 quintals of commercial fish per day;

a swine fattening center for 280 swine at Dobrotvorskaya GRES.

Place in operation by the 60th anniversary of the formation of the USSR the following:

the third stage of a broiler factory for 3 million broilers per year in the suburban communal zone of KamAZ;

a mixed feed plant for reprocessing 500 tons of grain per day at Bratsk -- in the first half of the year;

a hothouse combine with an area of 4 hectares at the Karagandinskiy sovkhoz;

a hothouse combine with an area of 6 hectares at the sovkhoz imeni 22 party congress in Dzhambul'skaya Oblast.

In the Area of Environmental Pollution

Execute construction-installation work on building facilities for environmental protection to an amount of 120.0 million rubles.

Implement capital repairs and modernization of ash traps at not less than 50 boiler units of thermal electrical power plants.

Carry out work at electrical power plants on building and modernizing water treatment plants that reduce the run-off of contaminated discharges by 11.6 million cubic meters of water per year.

Develop norms for the maximum allowable or temporarily approved discharges of harmful substances into the air for thermal electrical power plants located in cities with intense air pollution, determined by the Goskomgidromet [Hydrometeorological State Committee] schedule.

Workers, engineers, technicians, scientists and employees of the USSR Minenergo enterprises and organizations, in striving to honor with labor gifts the glorious jubilee -- the 60th anniversary of the formation of the USSR, assure the CPSU Central Committee and its Politbureau headed by the great Lenin's worthy successor, the outstanding political and state activist, Comrade L. I. Brezhnev, that they will fight selflessly to breath life into the directives of the 26th party congress and the November (1981) CPSU Central Committee Plenum and will relentlessly strengthen the unity and closeness of the Soviet people, and will provide a further increase in the efficiency and quality of work, and fulfill the plan and obligations for 1982 and of the five-year plan as a whole ahead of schedule.

The socialist obligations were discussed and adopted in collectives of the USSR Minenergo establishments and organizations and approved by the board of the ministry and the presidium of the Central Committee of the Electrical Power Plant and Electrical Equipment Industry Workers Trade Union on 29 March 1982.

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ELECTRIC POWER

UDC 620.9

FUEL, ENERGY COMPLEXES NEEDS DESCRIBED

Moscow TEPLOENERGETIKA in Russian No 5, May 82 pp 5-9

[Article by A. A. Troitskiy, USSR Gosplan: "Fuel and Energy Complexes of the Country"]

[Text] Supplying the country's fuel and energy requirements in recent years has become one of the key problems of the further development of the national economy.

The intensified attention to fuel and energy problems is related to the special features of the regional disposition of reserves that require huge expenditures to assimilate them. Moreover, to involve in the fuel-energy balance of the country the reserves located in the eastern region thousands of kilometers from basic fuel and energy consumption centers requires the solution of unprecedented transportation problems.

A search for ways for rapidly involving and most efficiently utilizing the rich eastern fuel deposits led to the substantiation of the expediency of creating fuel-energy complexes on their base by coordinating organically exploration, mining, fuel reprocessing, production of electric power, and the transport of the fuel-energy resources. The creation of the indicated complexes, being the most efficient form of economic utilization of fuel-energy resources, required the solution of very large departmental problems, related to the assimilation of the respective regions, to the creation of infrastructures, housing and social conditions on their territories. The use of reasonable interdepartmental cooperation and a comprehensive approach to the solution of numerous practical problems make it possible to reduce expenditures of resources and time to achieve the set goals.

The most important, modern fuel-energy complexes are the Pavlodar-Ekibastuz, Kansko-Achinsk and the Zapadno-Sibirskiy.

The most important components in these complexes are electric power and power construction links. In each complex there are single power construction bases which include the construction industry, construction materials enterprises, as well as territorial, procurement and transport bases. Here is taken into account the regional cooperation of such enterprises with enterprises built for the creation of fuel-extracting capacities.

In each complex there will also be created a centralized material-equipment base for operating the electric power enterprises, including repair, transportation and procurement organizations. New organizational management structures are envisioned for operating the electric power plants in the complexes. The electric power plants of the complex are to be considered as a single enterprise (association).

Technical solutions, assumed in designing electric power plants, reflect the advantages of cooperation and standardization within a group of electric power plants. These solutions provide the possibility of accelerated flow-line construction placing in operation, when necessary, up to 2 million kilowatts of new capacities per year at each of the complexes.

The construction of these complexes makes it possible to solve problems of creating modern housing-personal service conditions on a higher plane for builders and workers in fuel-energy enterprises on the basis of building new large cities.

The Pavlodar-Ekibastuz fuel-energy complex is based on the coal in the Ekibastuz and Maykyubensk deposits, whose reserves are estimated at 9 billion tons of coal. It is planned to increase fuel mining at these deposits in the future to 150-170 million tons per year to supply coal to 35 million kilowatt electric power plants with an electric power output of up to 220 billion kilowatt-hours per year, as well as to satisfy the fuel requirements of other local consumers.

Calculations have shown that these reserves of coal are sufficient to meet electric power requirements for the next 15 to 20 years not only of Kazakhstan, but also of adjoining regions in the Urals, Siberia and the OES [Consolidated Power System] of Central Asia. Due to the high ash content of Ekibastuz coal, reaching up to 45-47% with selective mining and up to 55% with bulk mining, its transportation is difficult and it is economically more efficient to transport the electric power over high and superhigh voltage electric power transmission lines for distances above 1000 kilometers.

In this connection, it is planned to build four electric power plants with total capacity of 16 million kilowatts directly at the coal deposits to supply electric power to Northern Kazakhstan and the transmission of their power to the European region over 1150 kilovolt AC overhead lines to the Urals and 1500 kilovolt DC -- to the central regions. Moreover, a Yuzhno-Kazakhstan GRES is being built on the shore of Lake Balkhash to supply electric power to adjoining regions.

The low cost of strip mining coal and progressive technical solutions in building the GRES will permit production of electric power at a production cost of up to 0.4 kopecks per kilowatt-hour.

In the designs of the Ekibastuz and Yuzhno-Kazakhstan GRES developed by the "Teploelektroproyekt" Institute, progressive technical solutions were applied, directed toward reducing construction costs and materials consumption, industrializing GRES construction and, on that basis, reducing labor expenditures and construction time. Eight 500,000 kilowatt power units with supercritical steam parameters are being installed at each GRES. At GRES-1, there are installed type P-57 boilers of the Podol'sk Machine Building Plant basically similar to boilers operating at the Troitskaya and Reftinskaya GRES. The boilers are designed to burn selectively mined coal with a maximum ash content of up to 45-47%, and eight hammer grinders are installed at each boiler.

Wet scrubbers and electric filters are used for two-stage ash-trapping.

Unlike GRES-1, the following electric power plants of this complex will be oriented toward burning high ash content bulk-mined coal with ash content of up to 55%. They will have P-57R boilers, especially adapted for burning high ash content fuel. Each boiler will be equipped with six medium speed grinders. The remaining technical solutions for the following GRES will have no principal differences from GRES-1. The main building of the GRES will have standard spans for the machine and boiler departments of 51 meters each, and a built-in deaerator set of shelves. The main building frame will be made of high strength and low-alloy steels. The industrial methods of flow-line installation will be taken into account in the design. For this purpose, a non-aligning method was developed for installing columns on foundations, as well as the unitized installation of multitier shelf frames and rigid frame joints using high-strength bolts. Wall enclosures and the roof of the main building will be made of prefabricated light metal panels that make it possible to install the walls in 12x12 meter units and the roof -- in 51x12 meter units. All these measures will reduce labor expenditures considerably in constructing the main building and will reduce steel consumption for each GRES by 5000 tons.

One complicated engineering problem in the GRES complex is the organization of the reception and reprocessing of large masses of coal (50 to 55 tons per day, for one GRES), that has relatively low heat of combustion. A new in principle fuel feed design was developed for the Ekibastuz GRES. In coal warehouses, it will use radial rotary loading stackers, powerful modernized hammer crushers, and crushing-cutting machines in the car-dumpling building. The buildings and fuel feed route are arranged to reduce the length of the supply lines.

RR turntables wil be used to deliver coal from open coal pits located nearby with a capacity of up to 50 million tons per year.

The four GRES complexes will use circulating systems for technical water supplies with water reservoirs created on the basis of natural depressions of bitter-salt lakes with small volumes of work for constructing water dams and practically without destroying ground suitable for agriculture. For GRES-2 and GRES-3, it is planned to create a common water reservoir with deep water intakes which provide deeper cooling of the water due to its spatial circulation. This will make possible an efficient turbine operation at an average annual water temperature of 15° to 16°C.

The water reservoirs will be replenished from the Irtysh-Karaganda Canal. It is considered that the creation in this region of large nonfreezing water surfaces with a total area of over 60 square kilometers will reflect positively on the microclimate of the region, while the rise in the ground water level will facilitate the development of a vegetation cover. The ecology of new water reservoirs will make it possible to develop fish farming.

The GRES designs specify storing the ash-slag residues of all four electric power plants at a single ash dump created at the Karasor salt lake that has a surface area of 135 square kilometers. To replenish the systems of circulating hydraulic ash removal from the GRES, it is planned to use blow-through water from the cooling water reservoirs. In the future, it is proposed to organize the utilization of the ash residue.

Smoke stacks 320 and 420 meters high will be built at the GRES to meet air pollution requirements. A repair plant is planned for the operating needs of all GRES which, by subcontracting between industrial enterprises, will do repair work for coal industry enterprises.

Housing for builders and operating personnel of the complex will be built basically in Ekibastuz.

The technically, economically and ecologically coordinated Ekibastuz fuel-energy complex is a new stage in the development of domestic electrical power engineering and power building.

In the 10th Five-Year Plan period, construction work was developed on GRES-1, and its first two units were placed in operation. In 1981-1985, it is planned to complete the construction of the first GRES, develop construction of GRES-2, and install not less than three power units in it, i.e., increase the capacity of the complex to 5.5 million kilowatts. Work will also begin on the construction of the following GRES fo the complex. Construction has developed widely on the Yuzhno-Kazakhstan GRES to insure its completion at the start of the 12th Five-Year Plan period and moreover, TETs will be built for operation on the Ekibastuz coal. To solve the problems posed on building the Ekibastuz complex, it is necessary, in the 11th Five-Year Plan period, to increase the volume of construction-installation work by 1.5 times as compared to 1976-1980. Special attention must be given to the construction of the 1150 kilovolt overhead line to the Urals because a lag in its construction and assimilation may lead to difficulties in the distribution of the developing capacities of the Ekibastuz GRES with a scarcity of electrical capacities in the Urals.

To provide coal to the new electric power plants, it is planned to increase the mining from 66 million tons in 1980 to 84 million tons in 1985.

The Kansko-Achinsk fuel-energy complex [KATEK] is being created on the basis of lignite coal of the Kansko-Achinsk basin, whose balance reserves exceed 110 billion tons and its geological reserves -- 400 billion tons.

Favorable mining-geological conditions make it possible to increase the strip mining of coal in the future to 1 billion tons per year. Unit reduced expenditures for mining 1 ton of conditional fuel, amounting to 6-7 rubles, are the best as compared to such indicators for all types of solid organic fuel mined in the USSR.

The Kansko-Achinsk coal has low ash content and low sulfur content, but has a high (up to 40%) moisture content, at heat of combustion about 3500 kilocalories (about 14.5 megajoule/kilogram. By using this coal, it is possible to build electric power stations with a total capacity of over 60 million kilowatts.

In connection with the special features of the coal, it is planned to utilize it to produce electric power basically directly at the mine site, transmitting the electric power to future consumers over overhead lines of various voltages. It is planned to export coal by rail to adjacent regions of Siberia for sources of heat supply only.

In the next 10 to 15 years, it is planned to utilize the Kansko-Achinsk coal to satisfy the requirements of the Siberian region in electric and heat energy. In the following period, the possibility is envisaged of transmitting electric power from this complex to the Urals and the central regions of the European part of the USSR over superhigh voltage overhead lines on a scale determined by the balance of the capacities and electric power.

At the same time, work developed to obtain from raw Kansko-Achinsk coal, enriched transportable solid and liquid types of fuel. Experimental industrial installations are being built for this purpose including the electric-technological ETKh-1000 installation in Krasnoyarsk which will be put in operation in 1982. The scale of reprocessing Kansko-Achinsk coal and the area of utilizing the products of their reprocessing will be made more precise depending upon the results of the finishing-off of various technological processes of reprocessing, and the technical-economic indicators of these technologies.

In the first stage, in the nearest ten-year period, it is planned to build 2-3 6.4 million kilowatt electric power plants using the raw coal of the western deposits of the coal basin (Berezovskiy, Uryupskiy and Itatskiy).

At GRES-1, whose construction is being developed, it is planned to install eight improved 800,000 kilowatt LMZ turbines, as compared to similar machines operating at the Zaporozhskaya and Uglegarskaya GRES.

Type P-67 ZiO boilers with a productivity of 2650 tons per hour, T-shaped type with a square combustion chamber and an angular arrangement of burners will be used. Eight grinding blowers will be installed at each boiler. The main building is a special design structure 122 meters high, 171 meters across and 700 meters long. The large dimensions of the building, especially of the height, are related to the size of the steam boiler to be used. To reduce these dimensions and corresponding volumes of construction-installation work and expenditures of resources, work will be developed on creating for the next GRES a new type of smaller size boiler -- the TsKTI.

The coal will be moved by conveyor belts to the GRES from the open pit 14 kilometers away; continuous action radial rotor machines will be installed at the GRES and progressive technical solutions developed for the Ekibastuz GRES will be used.

For the first GRES of the complex, it is planned to build circulating systems of water supplies with water reservoirs in small river beds. The water reservoirs will be created in marshy bottom lands which will not require the destruction of useful agricultural land. Water losses in the reservoirs will be replenished by the run-off of the small rivers. However, in the further development of KATEK, it will be necessary to regulate the run-off of the Chulym River or transfer a part of the Yenisey's run-off to the basin of this river. It is planned to utilize the warm discharge water of the GRES for intensive fish breeding.

It is planned to remove ash and slag hydraulically by a circulating arrangement using for ash dumps the shallow water in the upper parts of the water reservoirs, cut off by dams. In the future, it is planned to use worked-out coal open pits to store ash and slag residues. The dry removal and storage of ash are also being developed. In all cases it is planned to utilize the ash and slag from the GRES for construction and agricultural needs.

The estimated rated production costs of the KATEK GRES is 0.35 to 0.4 kopecks per kilowatt-hour for a unit construction cost of 170 rubles per kilowatt.

As indicated, GRES will be located directly near powerful coal open pits. The first open pits will have capacities as follows: Berezovskiy -- 55 million tons per year; Uryupskiy and Itatskiy -- 30 million tons per year.

Powerful coal excavators and high productivity conveyor belt systems will be used at these open pits. Large 120-ton self-unloading cars will be used to transport the coal.

Housing and communal-personal service enterprises for builders and operating cadres for power, as well as for coal enterprises will be built in Sharypovo. Powerful bases for construction and the operation of the open pits and the GRES will be created directly near the enterprises and the city.

The construction of the Berezovskiy open pit field and the KATEK GRES-1 began in the 10th Five-Year Plan period. In 1981-1985, it is planned to develop widely the construction of the complex and place in operation the first two 800,000 kilowatt units at GRES-1. It is planned to increase coal production in this basin from 35 million tons in 1980 to almost 50 million tons in 1985.

It is planned to increase by 4.6 times the volume of capital investments in the 11th Five-Year Plan period to build the complex as compared to the 10th Five-Year Plan period for the electric power sector alone. This will create the necessary reserves and construction base for the following rapid increase in KATEK capacities.

The West-Siberian fuel-energy complex is based on the petroleum and gas reserves located in Tyumenskaya Oblast. The electric power part of the complex is intended to supply electric power to gas and petroleum extracting enterprises, gas and petroleum pipelines and to supply electric power to the Urals.

The electrical power plants of the complex will be built to operate on natural and by-product gas directly near its deposits. Electric power capacities, intended to supply electric power to the Urals, based on preliminary economic calculations, may be located directly in the regions where the electric power is to be used. However, taking into account the real resource limitations on building mainline gas pipelines, it was decided it would be expedient to locate all electric power plants of the complex directly near the regions where the gas is produced and transmit the electric power to the Urals over 500 kilovolt electric power transmission lines in the first stage and later, as the amount of power is increased, over 1150 kilovolt lines. Locating these electric power plants according to economic indicators differs little from locating them directly in the regions where the electric power is used in combination with building mainline gas pipelines to transmit gas to the Urals.

In all, it is planned to increase electric power station capacities in the West-Siberian complex to 18-20 million kilowatts. The basic electric power center will be the Surgut electric power plant group. The Surgut GRES-1, whose rated capacity will be 3.3 million kilowatts, has already reached a capacity of 2.75 million kilowatts. The following equipment is being installed there: 13 210,000 kilowatt power units; two 180,000 kilowatt thermification energy units with T-180 turbines; an experimental industrial steam-gas 225,000 kilowatt power unit with a T-180 steam turbine; a 45,000 kilowatt GT-450-850 gas turbine; and a high pressure 600 ton per hour steam generator. Assimilating such steam-gas units that save 8 to 10% of the fuel and reduce the volume of construction-installation work, will make it possible later to use installations of this type to build other electric power plants in Tyumenskaya Oblast using gas fuel.

Surgut GRES-2 will have a capacity of 4.8 million kilowatts and it will have six 800,000 kilowatt power units. The machinery hall equipment of this GRES will be similar to the equipment of Berezovskaya GRES-1. Basically, its multiunit boilers will be similar to the 800,000 kilowatt boilers installed in the European part of the USSR with the difference that they will not provide for burning fuel oil as a second fuel.

The capacity of the Surgut GRES and the composition of its equipment are now being made more preicse taking into account the ecological conditions of the given region.

It is also planned to build a high power electric power station near Nizhnevartovsk operating on gas which will produce electric power as well as supply heat to this new city. It is planned to install four to six 800,000 kilowatt power units there and the necessary thermification machines. The capacity of this electric power plant and composition of its equipment will be determined after the completion of its design. Here, the expediency of installing at this TES, as well as at the Surgut GRES-3, 1.2 million kilowatt units will be considered.

It is planned to build a 2.5 million kilowatt GRES at Urengoy. It will have steam-gas power units.

It is planned, in the 11th Five-Year Plan period, to put in operation 795 kilowatt capacities at Surgut GRES-1, the first two 800,000 kilowatt power units at GRES-2, begin the construction of GRES-3 and develop widely the construction of the Nizhnevartovskaya and Urengoyskaya GRES and to put in operation their capacities in the first half of the 12th Fove-Year Plan period. To solve these problems in combination with building respective overhead lines, construction and operating bases, as well as housing will require assimilating 1.5 billion rubles of capital investments in the current five-year plan period, including over 1 billion rubles for construction-installation work.

The share of putting in operation new capacities at thermal electric power stations in the country, being built within fuel-energy complexes, increases continually. While in 1976-1980, only slightly more than 10% of all condenser electric power plant capacities placed in operation by the USSR Minenergo [Ministry of Power and Electrification] were at GRES complexes, in 1981-1986 it is planned to increase this share greatly.

Of great practical importance is improving the management for creating and functioning of fuel-energy complexes in order to coordinate the solution of complicated interdepartmental problems that may arise. Measures are being implemented for this purpose, especially in the area of complex development planning. Thus, tasks are set in the plans by ministries and departments on cooperative construction of industrial, housing, and cultural-personal services facilities that are of a general industrial sector, while in the plans for these complexes capital investments, equipment and material-technical recources necessary to implement the planned goals are listed separately. Finally, for the interindustrial coordination of the development of the West-Siberian complex, a special territorial commission of the USSR Gosplan was created in Tyumen.

It is necessary to continue work to improve further the management of the development of fuel-energy complexes of the country which are the most important structural links in our national economy.

The formation of the Ekibastuz, Kansko-Achinsk and other power complexes as a single economic organ puts forward new problems in the organization of construction and operation of various organizations and enterprises, which must be solved expediently on the basis of a single purposeful comprehensive program.

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LARGE TES COMPLEX DESIGN IN TYUMENSKAYA OBLAST

Moscow TEPLOENERGETIKA in Russian No 5, May 82 pp 16-20

[Article by engineers V. N. Okhotin, Yu. A. Gerke and R. M. Vilenskaya, Urals Branch of Teploelektroproyekt: "Design of a Large TES Complex Operating on the Natural Gas of Tyumenskaya Oblast"]

[Text] The uneven distribution of fuel reserves and industrial sectors in the territory of our country determined the following basic trends of power development.

Electric power in the European part of the USSR will develop on the basis of nuclear fuel, while in the eastern parts of the country, local fuel energy resources such as the coal of the Ekibastuz and Kansko-Achinsk deposits, the natural gas of Tyumenskaya Oblast and the large hydraulic resources of rivers must be utilized widely.

The problem will be solved at the same time as the transport of high quality fuel and electric power to the Urals and the European part of the USSR [1].

Natural gas deposits in the northern regions of the Tyumenskaya Oblast have been in the process of assimilation in the last several decades.

In spite of broad prospects of the development of the gas producing industry and the transport of gas to the western parts of the country, its use as a power fuel is considered to be limited and requires thorough all-around substantiation.

The USSR Minenergo [Ministry of Power and Electrification] together with the Mingazprom [Ministry of Gas Industry] and the Minneftegazstroy [Ministry of Construction of Petroleum and Gas Industry Enterprises] is preparing the technical-economic substantiation for constructing new large GRES north of Tyumenskaya Oblast to transmit electrical power to the Urals.

These power plants must be built in addition to those TES which are being built and those planned to supply electric power to petroleum and gas industries in the extreme north of Tyumenskaya Oblast, i.e., to take care of domestic needs of the gas and petroleum-bearing region.

Surgutskaya GRES

At present, the Surgutskaya GRES-1 is the basic source of electric power supply to the petroleum and gas fields of Tyumenskaya Oblast. After completing the construction of the third stage, the plant will also provide central heating to housing and industrial enterprises of Surgut.

The power plant is being built on compressed schedules under rigid natural-climatic conditions in a sparsely populated region. The first stage of the power plant was built without a RR using only water transport with the simultaneous creation of a construction-installation base.

An electric power network necessary to assimilate new petroleum and gas deposits, as well as for ties with the Urals OES [Consolidated Power System], developed in parallel.

The power was transmitted at 220 and 500 kilovolts.

A circulation water supply system was adopted with a water reservoir area of about 10 square kilometers, built on the basin of the Chernaya River, a tributary of the Ob' River. A 40,000 square meter sprinkling basin on the shallow water section of the existing water reservoir is planned for the third stage. The 16 power units of the power plant will have five circulating pumping stations on an open feed canal, as well as a pumping station for the sprinkling basin.

The frame of the main building was made of low alloy steel with high strength bolts used for installation joints. The walls were made of prefabricated metal panels with efficient insulation, as well as of keramzit-concrete panels. The foundations under the frame of the building and turbogenerators were precast.

These solutions made possible a great reduction of labor in transporting and building Surgut GRES-1.

Tr teen K-210-130 single type condensation power units were installed at Surgut GRES-1. The type of basic equipment began to change with power unit No 14 due to the necessity of Surgut thermification. According to the approved "Heat Supply Arrangement" heat to housing and industrial enterprises of the city must be provided by GRES-1 along with larger boiler plants which will span the peak part of the schedule.

For this purpose the following were projected for the GRES: two T-180/210-130 thermification turbines, a water preparation installation, a replenishment installation for a closed arrangement of hot water supply, network and replenishment pumping groups and other equipment to provide an output of 4940 gigajoules per hour of hot water of 70 to 150°C, including 2170 gigajoules per hour -- average winter load on the thermification turbines.

Thus, in the current year, it will be necessary to assimilate two main LMZ T-180/210-130-1 turbine installations in a unit with TG-104 boilers at GRES-1.

By-product and natural gases are the basic and reserve types of fuel for GRES-1, as well as all TES of the considered region.

Taking into account a reliable gas supply, as well as the remoteness and difficult terrain of the northern regions of Tyumenskaya Oblast, it is advisable to create compact, highly efficient steam-gas equipment for the group of power plants.

Of the greatest interest in that sense are steam-gas installations with high pressure steam generators (PGU with VPG). For several years, the "Teploelektroproyekt" has been working with the TsKTI [Central Scientific Research and Planning Design Institute imeni I. I. Polzunov] and plants of the Minenergomash [Ministry of Power Machine Building] to create and amnufacture the PGU-250 with VPG-600 TKZ, GT-45/850 KhTZ and K-210-130 LMZ power units whose prototypes must be installed at one of the electric power plants [2].

After achieving the required operating reliability, the power unit will be highly efficient -- using 305 grams of conventional fuel per kilowatt-hour and consuming less metal as compared to the 210 megawatt steam power unit.

The transportable dimensions of the VPG and the gas turbine machine, the possibility of its being completely manufactured at the plant and being checked on test stands will make it possible to reduce the cost of labor and installation work.

The schematic diagram of PGU-250 is shown in Fig. 1.

Positive results in assimilating this power unit will make it possible to establish a series of such units at the Urengoy GRES. During the period that Surgut GRES-1 was planned, the approach to solving the problems of environmental protection and, in particular, of air pollution, changed considerably.

Discharge gas from steam boilers burning nonsulfurous gaseous fuel were considered nontoxic at the start of the seventies. Because of this, the first stage of the GRES had metal smokestacks 60 meters high (one stack per two boilers). Taking into account discharge of nitrogen oxides, as well as the GRES-1 expansion to 3424 megawatts, the building, 1.5 kilometers from it of GRES-2 with a capacity of 4800 megawatts, as well as the gas contamination background, created by peak and industrial boiler installations that will operate in the future, it was necessary to reconsider solutions for smokestacks. It is planned to build two reinforced concrete smokestacks 240 meters high, connected to each gas conduit from eight boiler units.

Urengoy GRES

The basic and reserve fuel for this power plant is natural gas from the Urengoy deposit which will be fed over two mainline gas pipelines, each designed to take care of the full gas requirements. The plan considers the following composition of basic equipment:

Variation I -- Ten PGU-250 with VPG units of type unit No 16 of Surgut GRES-1.

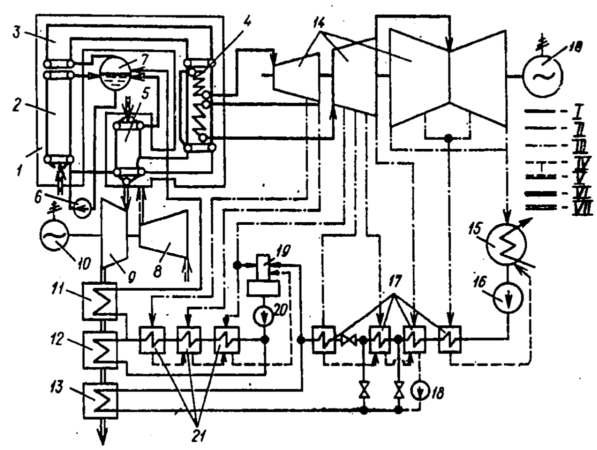

Fig. 1. Schematic heat diagram of PGU-250-130.
I -- superheated steam; II -- water; III -- steam from take-offs; IV -- drainage; V -- Air; VI -- fuel; VII -- products of combustion;
1 -- high pressure steam generator; 2 -- furnace; 3 -- by-pass gas conduit; 4 -- convection shaft; 5 -- additional combustion chamber; 6 -- forced circulation pump; 7 -- separator drum; 8 -- compressor; 9 -- gas turbine; 10 -- electric generator; 11 -- economizer; 12 -- gas-water high pressure heater; 13 -- gas-water low pressure heater; 14 -- steam turbine; 15 -- condenser; 16 -- condenser pump; 17 -- regenerative low pressure heaters; 18 -- drainage pump; 19 -- high pressure deaerator; 20 -- feed pump; 21 -- regenerative high pressure heaters.

Variation II -- Four steam power 210 megawatt units (first stage) and six PGU-250 with VPG (second stage) units. This variation is being developed in case there will be a delay in assimilating experimental unit PGU-250 at Surgut GRES-1.

Variation III -- 12 steam power 210 megawatt units.

Taking into account the severe climatic conditions, the power plant is projected with maximum interconnection between the auxiliary structures (standby starting, TETs KhVO [Services], warehouses, TsRM [Central Repair Shops], engineering-personal service building) and the main building.

Power output will be at 220 and 500 kilovolts.

Structural materials and equipment will be brought in over the Surgut-Urengoy-Yagel'noye RR line.

A complex of measures on environmental protection will be implemented at the GRES as follows: a closed cycle to purify sewage and run-off waters will be used; a fish breeding installation will be built; PDK [Maximum Premitted Concentration] and PDV [Maximum Permitted Discharge of Harmful Substances into the Air] requirements with respect to $NO_x + CO$ will be met; an experimental hothouse using the heat of smokestack gases will be built; an investigation of the effect of the water reservoir on the microclimate will be made, the frequency of forming fogs will be studied, etc.

It is planned to provide the following automatic systems to control the technological processes of power units and TES; a counter-emergency automatic system; dispatcher control facilities; as well as a system for the automatic control of power unit capacities and the power plant as a whole; and connecting it into the ARChM [Automatic Frequencv and (Active) Power Control] OES Urals circuit. A microrayon will be built in Tikhoy, the planned city for settling the operational and construction-installation cadres. The Urengoy GRES is being built and will be operated under severe climatic conditions of the extreme north and very complex geological conditions; therefore, along with exploratory-project work, the following scientific investigations are being done: of the danger of ground under the foundations for buildings and structures being frozen; properties of frozen ground when thawing; vibration stability of the earth under foundations for turbines, etc.

Surgut GRES-2

The construction of the 4800 megawatt GRES-2 began on the industrial site of Surgut GRES-1.

The technical economic indicators of the plant are shown below:

Power, megawatts	4800
Turbines	6xK-800-240-5
Steam boilers	6xTG MP204
Electric power output, gigawatt-hours	30,408
Electric power for their own needs, %	2.54
Staff coefficient, man/megawatt	0.357
Unit cost of industrial construction, rubles/kilowatt	183
Production cost of electric power, kopecks per kilowatt-hour	0.486
Profitability, %	24.7
Period of repayment, years	4.0
Unit consumption of conventional fuel, grams per kilowatt-hour	317.4

In connection with the sharp increase in the volumes of construction-installation work, a considerable expansion of the production and repair base is planned of the construction-installation organizations by creating regional production-procuring bases (RPKB) using the experience in designing and building such bases for the Ekibastuz and Kansko-Achinsk fuel-energy complexes.

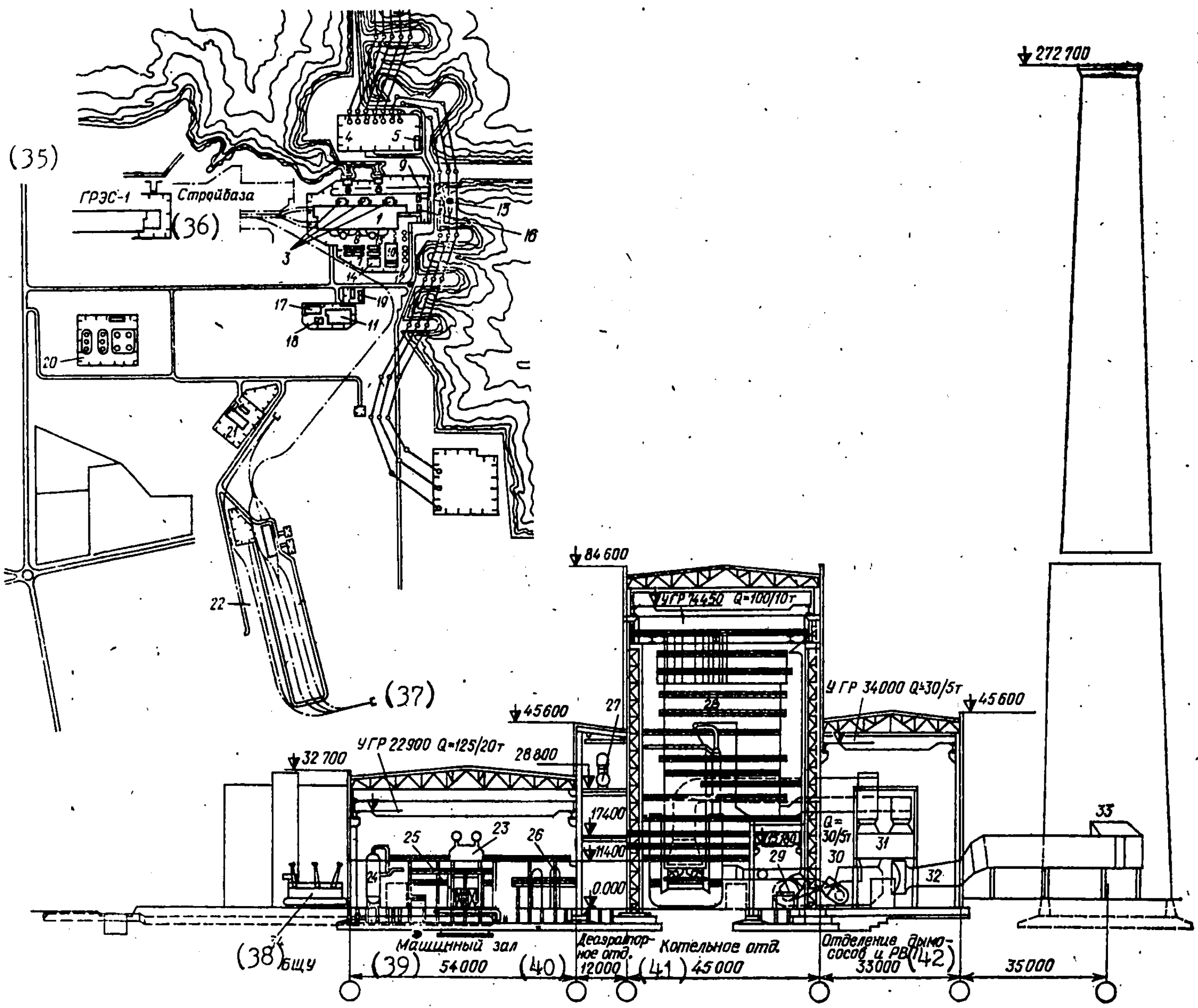

Fig. 2. Surgut GRES-2 with capacity of 4800 megawatts.
1 --main building; 2 -- unitized control panel; 3 -- open transformer installation; 4 -- open distribution 500 kilovolt installation; 5 -- block of auxiliary ORU-500 kilovolt structures; 6 -- gas distribution center; 7 -- gas purification buildings; 8 -- unitized pumping station with the pumping station for production-fire protection water supply; 9 -- open diversion canal; 10 -- chemical water purification with a chemical reagent warehouse and purifying buildings; 11 -- consolidated repair center with a special building; 12 -- general plant compressor and diesel building; 13 -- electrolysis installation with a consolidated pumping station to transfer fecal, greasy and torrential drainages; 14 -- acetylene generating plant

Fig. 2. Legend continued

with a carbide storeroom; 15 -- oil department; 16 -- engineering-personal service building; 17 -- construction-repair shop; 18 -- diesel engine depot; 19 -- motor vehicle building; 20 -- fuel oil building with emergency fuel; 21 -- electric installation products plant; 22 -- heat installation base; 23 -- turbine; 24 -- vaporizer; 25 -- condenser; 26 -- high pressure preparator; 27 -- deaerator; 28 -- steam boiler; 29 -- blower; 30 -- recirculation exhaust fan; 31 -- regenerative air heater; 32 -- axial exhaust fan; 33 -- smokestack; 34 -- transformer; 35 -- GRES-1; 36 -- construction base; 37 -- UGR; 38 -- BShchU; 39 -- Machinery hall; 40 -- Deaerator department; 41 -- Boiler department; 42 -- Exhaust fan and RVP department.

The GRES-2 design approved in 1981 was based on 800 megawatt steam power equipment. The design was developed for using the following basic equipment. TGMP-204, 2650 tons per hour PO [Production Association] TKZ [Turbine and Boiler Plant] steam boilers with partial modernization, taking into account operation on gas fuel only; type K-800-240-5 POT LMZ turbines in a new standardized arrangement that made it possible to reduce the length of the unit to 72 meters (as against 108 meters at the Zaporozhskaya and Uglegorskaya GRES [3]. The arrangement of the boiler room is very compact.

A cross section of the main building is shown in Fig. 2.

The total length of the main building will be 543 meters. The main building of GRES-2 will be located on the shore of the projected water reservoir with the permanent end facing east; thus, the temporary ends of GRES-1 and GRES-2 limit the general installation-assembly sites. A section of the northern side of the existing flood water spillway of the GRES-1 water reservoir will be used for the 500 kilovolt ORU [Open Distribution Installation]. The basic and reserve fuels will be gas from the Tyumenskaya deposits while fuel oil will be the emergency fuel.

The transfer to purely gas fuel requires new solutions for the boiler equipment because gas, unlike fuel oil for which the TGMP-204 boiler is designed, makes it possible to increase the intensity of the heat in the furnace, standardize heat exchange by the installation of double screens and increase the velocity of the gases [4].

All this will lead to reducing the dimensions and metal consumption of the boiler and, as a result, to a reduction in construction costs, installation labor, construction time, an increase in efficiency and an improvement in repair conditions.

Various organizations (PO TKZ, ZiO [Podol'sk Machinery Plant], NPO [Scientific Production Association] TsKTI, VGPI [All-Union State Planning Institute], Teploelektroproyekt etc.) have created large scientific, design and experimental-industrial reserves for the production of compact boilers with gas-tight panels.

The positive eight-year experience in operating compact Ye-500-140 GMVN boilers at Rostovskaya TETs-2 was taken into account. It is planned to develop and create a compact 2650 tons per hour steam boiler to operate on gas in 800 megawatt power units with a reduction in metal consumption indicators and dimensions [5].

Two boiler variations are being considered: a boiler suspended from the building structures; a frameless boiler with a cellular self-supporting structure of gas conduits made of all-welded panels and a rotational TsKTI furnace.

Table 1 shows a comparison between TGMP-204 and MGPG boilers in accordance with the NPO TsKTI version of the Teploelektroproyekt Institute developments.

Table 1

Steam boiler characteristic	Steam boiler: TGMP-204	Steam boiler: MGPG
Boiler type	Gas-tight with balanced draft, P-shaped	Compact, with rotary furnace, gas-tight pressurized
Efficiency coefficient of boiler, %	93*	94.5
Total weight of boiler metal (with RVP)		
tons	9700	4980
kg/kw	12.1	6.2
Metal weight under pressure		
tons	4800	2474
kg/kw	6.0	3.1
Boiler width along front (at screen axes), meters	20.6	36.0
Boiler width (at screen axes), meters	29.0	22.4
Elevation of upper point of boiler, meters	62.3	26.0

A reduction in the dimensions and metal consumption of the boiler is substantiated by the following solutions:

highly boosted compact rotary furnace;

compact arrangement of furnace and convective gas conduits;

all-welded double screens and shielded heating surfaces;

new standardized design of the steam superheater;

*Increase of heat losses of the boiler with discharge gases of about 0.8% is taken into account; the increase in electric power consumption for their own needs is about 0.7%.

horizontal, bent all-welded panels, forming a self-supported cellular structure, resting on its own portal;

ribbed low-temperature heating surfaces.

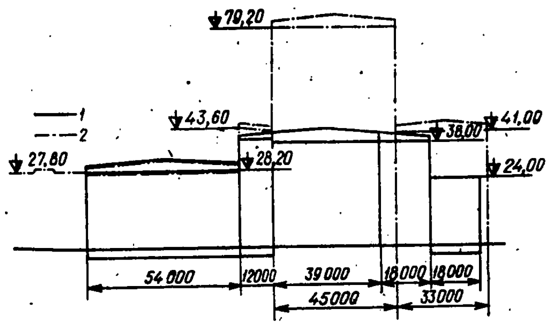

Fig. 3. Comparison of main buildings of GRES-4800 (6x800) for natural gas (cross sections).
1 -- GRES with compact boilers; 2 -- GRES with TGMP boilers (Surgut GRES-2).

Comparative GRES-4800 indicators with TGMP-204 and compact MGPG-2650 boilers are shown in Fig. 3 and Table 2 (data by the Teploelektroproyekt VGPI).

The time of changeover of Surgut GRES-2 to compact boilers must be made more precise in accordance with the actual schedule of the manufacture of the steam boilers.

Such a change seems very advisable from the standpoint of finishing-off and assimilating the new equipment for the succeeding power plants of the considered region.

Nizhnevartovskaya GRES

In 1982, the Ural Branch of the Teploelektroproyekt must develop "Substantiating materials for building the Nizhnevartovskaya GRES" with the selection of the sites for the power plant and settlement. If this site is located at a distance from Nizhnevartovsk which would economically justify the heat supply from the GRES turbines to the city, then the basic heating, ventilation and hot water needs of the city would be met by turbine take-offs, with the changing over of large heating boilers to the peak mode and building mainline heating networks from the GRES to the boiler installations. In the future, development of the city heat loads may be provided by take-offs of three K-800-230-5 turbines in a set with groups of 580 to 840 gigajoules per hour network heaters.

Table 2

Name	GRES-4800 with TGMP-204	GRES-4800 with MGPG-2650 TsKTI
Cell of 800 megawatt unit, meters	72x144 without (BShchU)	72x141
Unit construction area	0.015	0.014
Unit volume, m^3/kilowatts	0.0725	0.0466
Boiler metal consumption, thousands of tons	58.9	29.9
Frame of main building metal consumption, thousands of tons	87.6	33.6
Capital investments for main building:		
Million rubles	456.6	405.8
rubles/kw	95.13	84.55
Capital investments saved:		
million rubles	-	50.8
rubles/kw	-	10.6

Thus, taking into account the given capacity, it is advisable to equip the GRES with six 800 megawatt power units and with steam boilers of a new, improved design tested on the last power units of Surgut GRES-2. The arrangement of the main building must be solved taking into account the sizes and arrangements of the new steam boiler and the simultaneous introduction of solutions of progressive arrangements (arrangements without deaerators), new equipment for the turbine regeneration system (mixing PND, unifilar PVD, new BROU etc.).

Thus, a similar 800 megawatt GRES, using gas can be created on the basis of the Nizhnevartovskaya GRES.

New GRES

It is planned to build one more large GRES in the Tyumenskaya Oblast.

Preliminary project work is being done at present to determine the construction site and substantiate the optimum power plant capacity.

At this GRES, besides steam turbine power units, there will also be considered the use of the up 800 megawatt large steam-gas installations with GTU-150 gas turbines in various combinations with high pressure steam generators according to the TsKTI arrangement, and with utilizer boilers (in accordance with the VTI [All-Union Thermotechnical Institute imeni F. E. Dzerzhinskiy] arrangement).

Conclusions

1. The Surgut GRES-1 and the Urengoy GRES are based on 210-250 megawatt power units. High efficiency and compact PGU-250 with VPG must be assimilated and operated at these power plants.

2. For Surgut GRES-2, Nizhnevartovskaya and new GRES, it is advisable, from the viewpoint of maximum standardization of solutions (construction, technological, electric equipment, power output and operating and repair conditions), to adopt 800 megawatts as a single capacity of the power unit.

3. It is necessary to accelerate in every possible way the work of designing and manufacturing a smaller and less metal consuming steam boiler with a productivity of 2650 tons per hour for burning gas.

4. It is necessary to accelerate the development and introduction of solutions of the progressive arrangement and auxiliary equipment for a new series of 800 megawatt gas-burning power units, as well as to intensify work on the creation of large steam-gas installations with capacities of up to 800 megawatts with high pressure steam generators and boilers-utilizers.

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CSO: 1822/186

ELECTRIC POWER

TWO BRIEF BOOK REVIEWS

Moscow TEPLOENERGETIKA in Russian No 5, May 82, p 66

[Advertisement: Respected Readers! Energoizdat offers to your attention books being prepared for publication in 1982]

[Text] Nuclear electrical power plant. No 5, Symposium of articles, 23 pages, illustrations. Translation. 1 ruble 50 kopecks, 4500 copies.

The next in turn issue of the symposium is devoted basically to generalizing equipment operating and repairing experience of AES with various types of reactors. Experience in repairing KIPiA [Control and Measurement Instruments and Automatic Equipment] and recommendations are given on stage by stage repairs of turbines and tightening their flange joints. New methods for the activity and consumption of the heat carrier are cited. A method is described for monitoring the condition of objects in the external medium. Several articles are devoted to the search for defective fuel elements. As in previous issues of the symposium, a special section has articles on designing and building AES.

For AES engineers and technicians, and installation, tune-up and design organizations.

Yantovskiy, Ye. I.; Pustalov, Yu. V. "Steam Compressor Heat Pumping Installations." 8.5 pages, illustrations (Economy of Electric Power and Heat). 45 kopecks. 10,000 copies.

Heat transformers are considered -- heat pumps capable of low potential heat (from envrionment or discharge waters) to a higher temperature level by means of machines that implement a reverse thermodynamic cycle. The replacement of fuel water heating boilers and electric boilers by heat pumping installations makes it possible to save fuel, improve the condition of the air and regulate the load of the power system. Basic arrangements are given of widely used steam compressor heat pumps using low boiling point working media (Freons), calculations of large capacity heat pump installations, arrangements for their use in power systems, as well as results of experimental investigations of these installations with sea water and discharge cooling water of electric machines.

For power engineers who investigate and design heat exchange installations.

These books can be acquired in all stores that distribute scientific-technical literature.

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ENERGY CONSERVATION

RESULTS OF ALL-UNION COMPETITION FOR ENERGY CONSERVATION

Moscow PROMYSHLENNAYA ENERGETIKA in Russian No 1, Jan 82 pp 2-4

[Article by S. I. Veselov, chairman of jury of All-Union competition, and I. M. Fetisova, executive secretary of jury of All-Union competition]

[Text] The All-Union council of scientific and technical societies, the central board of the NTO [scientific and technical society] of power engineering and the electrotechnical industry and the USSR Ministry of Power Engineering and Electrification have summarized the results of the 36th All-Union competition for the best proposal on conservation of electric and thermal energy. The competition, in which more than 12,000 scientific workers, engineering and technical personnel and workers of all sectors of the national economy participated, contributed to solution of problems of increasing the utilization efficiency of fuel and energy resources, propaganda and dissemination of leading experience in the field of energy conservation.

The assistance committees to the All-Union competition at enterprises of Energonadzor considered 5,323 suggestions with an annual saving of 1.9 billion kW·hr of electric energy and 5.7 million Gcal of thermal energy from introduction of them. Together with the councils of the NTO, the assistance committees held 95 republic, kray and oblast competitions for the best proposal on conservation of fuel and electric and thermal energy. From the results of local competitions, 1,222 suggestions (3,074 authors) were awarded money prizes, 630 authors were awarded diplomas and 531 authors were awarded honorary certificates of NTO and VOIR [All-Union Society of Inventors and Efficiency Experts]. Information letters were issued on the results of conducting the local competitions and recommendations were made to put the prize suggestions into production.

Energonadzor [State inspection for industrial power engineering and for power engineering supervision] enterprises Dneproenergo [State Administration of the Dnepropetrovsk Oblast Power System Management] (it presented 324 suggestions Krasnoyarskenergo [State Administration of the Krasnoyarsk Oblast Power System Management] (284 suggestions), Mosenergo [Moscow Regional Administration of Power System Management] (259 suggestions), Kuybyshevenergo [State Administration of Kuybyshev Oblast Power System Management] (240 suggestions), Moldglavenergo [Moldavian Main Administration of Power System Management] (157 suggestions), Saratovenergo [State Administration of Saratov Oblast Power

System Management] (153 suggestions), Odessaenergo [State Administration of Odessa Oblast Power System Management] (145 suggestions), Karagandaenergo [State Administration of Karaganda Oblast Power System Management] (118 suggestions), Orenburgenergo [State Administration of Orenburg Oblast Power System Management] (115 suggestions) and so on worked actively in conducting the local competitions.

A total of 1,755 suggestions with a saving of 1.3 billion kW·hr of electric energy and 4.4 million Gcal of thermal energy was presented to the All-Union Competition. Power engineers, workers of ferrous and nonferrous metallurgy, chemistry, petrochemistry and oil refining, the automotive and the light and textile industry participated actively in the competition (see table).

Sector of Industry	Number of Incoming Suggestions		Annual Energy Conservation			
			Electric		Thermal	
	Number	Percent	Million kW·hr	Percent	Thousand Gcal	Percent
Ferrous metallurgy	220	12.4	136.3	10.2	535.0	12.3
Chemistry	182	10.4	90.9	6.8	578.7	13.3
Petrochemistry and oil refining	125	7.1	49.9	3.7	383.6	8.8
Nonferrous metallurgy	103	5.9	124.6	9.3	332.0	7.6
Power engineering	99	5.6	289.2	21.8	901.9	20.7
Textile and light	78	4.4	15.9	1.2	112.5	2.5
Automotive	70	4.0	31.8	2.4	59.9	1.4
Timber, pulp-paper and woodworking	65	3.7	21.3	1.6	173.4	3.9
Construction materials	59	3.4	26.2	2.0	207.4	4.8
Aviation	49	2.8	17.5	1.3	26.2	0.6
Electrotechnical	43	2.5	36.6	2.7	24.4	0.5
Petroleum	38	2.2	131.6	9.9	113.1	2.6
Machine tool building	38	2.2	22.0	1.6	3.3	0.1
Coal	33	1.9	16.4	1.2	11.0	0.3
Rail	32	1.8	24.0	1.8	18.0	0.4
Construction	32	1.8	10.8	0.8	45.5	1.0
Electronic and radio engineering	29	1.6	9.1	0.7	25.0	0.6
Food	29	1.7	1.8	0.1	95.1	2.1
Medical	21	1.2	32.1	2.4	85.8	2.0
Communal housing	19	1.1	20.1	1.5	21.4	0.5
Communications equipment	15	0.9	1.9	0.1	5.1	0.1
Agriculture	15	0.9	61.4	4.6	20.1	0.5
Meat and milk	14	0.8	1.6	0.1	13.6	0.3
Instrument building	13	0.7	5.5	0.4	20.5	0.5
Microbiology	12	0.7	3.6	0.3	30.1	0.65
Gas	11	0.6	3.9	0.3	10.5	0.2
Shipbuilding	11	0.6	1.5	0.1	16.2	0.4

[Continued on following page]

Sector of Industry	Number of Incoming Suggestions		Annual Energy Conservation			
			Electric		Thermal	
	Number	Percent	Million kW·hr	Percent	Thousand Gcal	Percent
Procurement	9	0.5	2.9	0.2	---	--
Fishing economy	7	0.4	1.2	0.1	6.9	0.16
Local	7	0.4	0.7	0.1	4.1	0.09
River fleet	6	0.3	2.7	0.2	---	--
Machine building	142	8.1	81.8	6.1	118.6	2.7
Including:						
tractor and agricultural	46	2.6	32.6	2.4	19.1	0.4
heavy and transport	24	1.4	12.6	0.9	5.9	0.1
chemical and petroleum	17	1.0	13.7	1.0	9.1	0.2
power engineering	13	0.7	9.4	0.7	10.6	0.2
construction, highway and municipal	10	0.6	3.1	0.2	3.6	0.1
light and food	8	0.5	1.1	0.1	13.1	0.3
general machine building	8	0.5	6.7	0.5	0.9	0.02
Miscellaneous	129	7.4	58.0	4.3	366.8	8.4
Total	1,755	100	1,334.8	100	4,365.7	100

The assistance committees at the Energonadzor enterprises Chelyabenergo [State Administration of Chelyabinsk Oblast Power System Management] (123 suggestions), Bashkirenergo [State Administration of Bashkirskaya ASSR Power System Management] (92 suggestions), Kuybyshevenergo (88 suggestions), Lenenergo [Leningrad Regional Administration of Power System Management] (88 suggestions), Sverdlovenergo [State Administration of Sverdlov Oblast Power System Management] (84 suggestions), Dneproenergo (73 suggestions) and others presented the largest number of suggestions to the 36th All-Union Competition. The jury of the competition awarded prizes for 183 of the best suggestions, due to introduction of which an annual saving of 282.5 million kW·hr of electric energy and 911,000 Gcal of thermal energy was achieved, which comprises 7.9 million rubles.

The jury awarded the first prize of the competition for the suggestion "Modernization of utility boilers for combustion chamber furnaces of the polymetal combine," developed by workers of the PO [production association] Uralenergotsvetmet jointly with workers of the Leninogrosk Polymetal Combine.

An increase of the operating reliability of the utility boiler was achieved due to its U-shaped configuration and new design of the screens with collective blocks that form the top cover and also as a result of changing the spacing of the evaporating screens in the gas lines of the boiler, aerodynamic optimization of the gas flow by using a new design of the separating wall, increasing the volume of the intermediate hopper of the boiler and making its cooling more efficient and using a detachable design of the top cover. Introduction of these measures made it possible to increase the continuous operating life of the furnace-boiler complex from 10 to 240 days and to save 46,618 Gcal of thermal energy and 887,000 kW·hr of electric energy annually by utilizing the heat of exhaust gases. Utility boilers of similar design will find broad application at other enterprises of the sector.

The first prize of the competition was also awarded to the suggestion "Utilization of the heat of distillery fluid of soda production" of workers of the Siberian Branch of NPO [scientific production association] Tekhenergokhimprom and the Sterlitamak PO Soda, which was directed toward conservation of thermal energy, the use of secondary energy resources and environmental protection.

According to the existing technology of calcined soda production, the distillery liquid with temperature up to 95°C was dumped into a slurry collector as production waste. An installation in which the heat of the distillery liquid can be used both to heat the chemically purified and the circulating network water in the heating system was developed and introduced for the first time in the practice of soda production by the ammonia method. The experimental-industrial installation for using the heat of distillery liquid of type UITDZh-500, introduced at the Sterlitamak PO Soda, made it possible to achieve an annual saving of 52,920 Gcal of thermal energy. The contract design and detail plan of an industrial installation on the use of the heat of distillery liquid is now being developed for the Berezniki Soda Plant, the Sterlitamak PO Soda and the Crimean Soda Plant. The total annual saving of thermal energy should exceed 300,000 Gcal.

The jury awarded the second prize of the competition for the suggestion "Modernization of evaporative cooling installations of copper refining furnaces" of workers of the Uralelektromed' [expansion unknown] combine. New furnace components--caissons of vertical and horizontal gas lines, a rotary slide valve, pivot beams, tubular wall caissons for enclosure and protection of openings between windows, burner nozzles, support beams of the end burner wall and so on--were used as a result of introducing a number of efficiency suggestions of the combine workers. Modernization of the evaporative cooling system made it possible to increase the stability of the cooled components of the furnace by a factor of more than 8-10, to bring the degree of utilization of VER [expansion unknown] (with regard to utility boilers) up to 72.2 percent, to increase the productivity of the copper foundry, to considerably reduce the consumption of refractories, to considerably increase the efficiency of the evaporative cooling installations and to save more than 58,000 Gcal of thermal energy annually.

The suggestion of workers of the Magnitogorsk Metallurgical Combine imeni V. I. Lenin "Reconstruction of the intradrum separation device on utility boilers for two-vat steel smelting furnaces," for which the jury of the competition also awarded second prize, will find application at enterprises of ferrous metallurgy. The separation device of drums, installed according to the design on all utility boilers, was not guaranteed the required separation, as a result of which there were discharges of boiler water into the steam heater.

Reconstruction of the separation device made it possible to eliminate completely the discharge of condensation moisture into the steam heater, to reduce the idle times of the boiler, to increase generation of steam, to stabilize operation of the furnace-utility boiler-gas scrubbing-flue system and to reduce the consumption of water-steam mixture to purge the boilers. Reconstruction of the indicated device at the Magnitogorsk Metallurgical Combine alone guaranteed a saving of 30,210 Gcal of thermal energy annually.

A number of other interesting works was awarded prizes of the competition. They will all find broad application at many enterprises of the national economy, which will permit a significant contribution to solution of problems of increasing the utilization efficiency of the country's fuel and energy resources.

Organizations of the State Power Engineering Inspection and councils of scientific and technical societies devoted a great deal of attention to problems of dissemination and introduction of the suggestions awarded prizes at the All-Union and local competitions. A total of 2,475 suggestions was put into production in 1980 upon recommendation and under the verification of inspectors of Energonadzor enterprises, which permitted a saving of an additional 572 million kW·hr of electric energy and one million Gcal of thermal energy in the national economy.

The ministries of nonferrous metallurgy, the chemical, petrochemical and oil refining industry, lumber, pulp-paper and woodworking and shipbuilding industries published information on the most valuable suggestions for the corresponding sectors of industry. Other ministries sent letters to subordinate enterprises on the results of the 25th All-Union competition with recommendations on introduction of the prize suggestions.

At the same time some ministries and scientific and technical societies are not devoting the proper attention to propagandizing of the tasks and conditions of the All-Union competition and to development of efficiency work on problems of energy conservation. Few suggestions come into the All-Union competition from a number of machine building, construction, microbiology, fishing, local and gas industry enterprises.

The assistance committees to the All-Union competition of a number of Energonadzor enterprises and NTO councils are not working actively in propagandizing the conditions of the competition, rendering assistance to the primary organizations of the NTO of enterprises in intensification of efficiency work directed toward conservation of energy resources. The assistance committees of the Energonadzor enterprises Buryatenergo, Gruzglavenergo [Main Administration of Georgian Power System Management], Kamchatskenergo, Kostromaenergo, Tyumen'energo, Chuvashenergo, Yakutskenergo and Uzenergonadzor did not present a single suggestion to the 36th All-Union competition. The assistance committees to the All-Union competition of Energonadzor enterprises Arkhenergo, Amurenergo, Karelenergo, Ryazan'energo and others worked with insufficient activity. Local competitions for the best suggestion on conservation of electric and thermal energy were not held in many republics, krays and oblasts, including the Georgian SSR, Kirgiz SSR, Latvian SSR and the Donetskaya, Khar'kovskaya, Kurskaya, Sverdlovskaya and other oblasts.

The Presidium of the All-Union Council of Scientific and Technical Societies, the Presidium of the Central Board of the NTO of Power Engineering and the Electrotechnical Industry and the USSR Ministry of Power Engineering and Electrification, having considered the results of the 36th All-Union Competition:

confirmed the decision of the jury on the results of the 36th All-Union competition for the best suggestion on conservation of electric and thermal energy;

obligated the central, republic, kray and oblast boards and councils of scientific and technical societies to consider the results of the 36th All-Union Competition, to recommend the best work to economic bodies for use and to monitor introduction of them into production;

requested the ministries to publish information letters on the prize suggestions at the 36th All-Union Competition and orders on their introduction into production and also to obligate the managers of enterprises at which the prize suggestions were developed and introduced to publish information on the prize suggestions at the requests of other enterprises and organizations;

commissioned the jury of the competition, the Department of Scientific and Technical Propaganda and raising the qualifications of specialists of VSNTO [All-Union Council of the Scientific and Technical Society], the committee of VSNTO on problems of efficient use of material resources and the editorial boards of the journal TEKHNIKA I NAUKA to organize broad propaganda of the prize competition work, using the press, radio and houses of technology of NTO for this;

decided to hold the 37th All-Union Competition in 1982 for the best suggestion on conservation of electric and thermal energy and obligated the boards and councils of NTO, Energonadzor enterprises and regional power engineering boards to organize broad propaganda of the goals and tasks of the competition, to direct the creative activity of workers toward finding and use of reserves for conservation of energy resources and to conduct local competitions on conservation of energy resources in oblasts, krays and republics;

confirmed the committee (jury) of the 37th All-Union Competition for the best suggestion on conservation of electric and thermal energy;

turned the attention of the chiefs of the Main Administrations and control energy systems of Buryatenergo, Gruzglavenergo, Kamchatskenergo, Kostromaenergo, Tyumen'energo, Chuvashenergo and Yakutskenergo toward the need to implement measures to improve the work of the assistance committees to the All-Union Competition in propagandizing the conditions of the competition, selection of suggestions at enterprises, rendering assistance in formulation of them and also in organization of local competitions on conservation of energy resources.

Glavgosenergonadzor and the jury of the All-Union competition devote special attention of the energy services of ministries, agencies and assistance committees to the competition to the need for the most rapid introduction of the prize suggestions into production to achieve an additional conservation of energy.

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FUELS

UDC 622.276.5.338.27

ANALYSIS, PLANNING, FORECASTING COST OF OIL PRODUCTION

Moscow ANALIZ, PLANIROVANIYE I PROGNOZIROVANIYE SEBESTOIMOSTI DOBYCHI NEFTI in Russian 1981 (signed to press 11 Jun 1981) pp 1-3, 111-112

[Annotation, introduction and table of contents from book "Analysis, Planning and Forecasting the Cost of Oil Production", by Mars Timir'yanovich Shakirov, Vladimir Pavlovich Khalyavin, Il'ya Ivanovich Leshchinets and Viktor Yeliseyevich Tishchenko, Izdatel'stvo "Nedra", 1,500 copies, 112 pages]

[Text] Annotation

The characteristics of formation and the methods of analysis of the economic indicators of oil production are described. Methods and reserves for reducing operating losses at the level of the production units of oil-producing associations are indicated. Methodological prerequisites of economic and mathematical modelling and forecasting of the economic indicators of oil production are outlined and methods and models are proposed that permit one to solve a wide range of practical problems in analysis of the indicators of oil production.

The book is intended for economists, planners and other engineering and technical personnel of oil-producing enterprises and organizations. It will be useful to students of petroleum higher educational institutions and faculties.

Introduction

The economic problem of increasing the economic effectiveness of production under modern conditions occupies the leading position in development of socialist industry. The cost of oil production is one of the main indicators in estimating the effectiveness of the oil-producing industry. Therefore, it is no accident that a great deal of attention is being devoted to planning and analysis of the production and economic activity of oil-producing enterprises in the papers of Soviet authors N. M. Nikolayevskiy, I. I. Ryzhenkov, L. M. Umanskiy, A. N. Buchin, L. P. Gruzhnovskiy, V. Z. Fattakhov, R. K. Panova and others.

Economic and mathematical methods of analysis and planning, specifically economic statistical modelling, are now used ever more frequently in economic research. This direction is comparatively new but it is developing rapidly and has already achieved wide recognition of many specialists. Economic research using quantitative methods acquires a new, higher quality and fully corresponds to the modern requirements of management. The value of mathematical methods and economic statistical modelling is especially high in solving practicaly problems under operational conditions at ASU [automatic control system] enterprises. However, it should be recognized that economic mathematical modelling using computers in the practical activity of low-level cost-accounting enterprises has not achieved sufficiently wide distribution. Such problems as economic mathematical analysis of production expenditures, planning the cost of oil production and other problems of important significance in solving practical problems of increasing the efficiency of the oil-producing industry require their own solution.

This book is devoted to development and application of economic mathematical methods and models for use in analysis, planning and forecasting of the cost indicator of oil production.

The methodological procedures and selection of the form of economic mathematical relationship of the investigated indicator to factors that significantly affect its level and dynamics are determined to a considerable degree by the conditions of formation of the cost of oil production. Therefore, special attention is devoted in the book to formation of production expenditures at different stages of exploitation of a field. Economic statistical analysis of the cost of oil production, the estimate of the production and economic activity of an enterprise, planning and forecasting of the cost of oil production and economic mathematical models of this indicator for solving practical problems occupy an important position.

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PIPELINES

UDC 622.692.4.07

UNDERGROUND TRUNK PIPELINES

Moscow PODZEMNYYE MAGISTRAL'NYYE TRUBOPROVODY in Russian 1982 (signed to press 30 Nov 81) pp 1-8, 383-384

[Annotation, introduction, table of contents and bibliography from the book "Underground Trunk Pipelines (Design and Construction)", by Petr Petrovich Borodavkin, Izdatel'stvo "Nedra", 6,700 copies, 384 pages]

[Text] Annotation

Problems of the design and construction of underground trunk pipelines for transport of oil, gas and their refining products are considered. Based on generalization of domestic and foreign experience of construction and also from the results of the author's investigations, materials are presented on guaranteeing high reliability of main pipelines over a long period of their operation. Special attention is devoted to stabilization of the position of underground pipelines, pinching of pipes in soils having low supporting capacity (swamps, permafrost, flooded soils and so on). The book is intended for engineering and technical personnel involved in the areas of design, construction, operation and repair of trunk pipelines. It may be useful to students of higher educational institutions.

Introduction

In his summary report to the 26th CPSU Congress, Comrade L. I. Brezhnev said: "Gas and oil production in Western Siberia and their transportation to the European USSR must be done by the most important sections of the Energy program of the 11th and even of the 12th Five-Year Plans."[1]

The Congress posed the problem: "Increase the efficiency and operating reliability of the country's unified gas supply system,"[2] the basis of which are large main gas pipelines.

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[1] "Materialy XXVI s"yezda KPSS" [Materials on the 26th CPSU Congress], Politizdat, 1981, p 39.

[2] Loc. cit., p 150.

Pipeline transport of oil and gas from a narrowly specialized engineering system, as it was only 30-40 years ago, has been transformed to a large sector of the national economy. Tens of billions of rubles are invested annually in its development. This circumstance requires a scientifically based approach to distribution and expenditure of such enormous funds and does not permit one to make even slight miscalculations both in general and in special decisions. If scientific investigations are analyzed for a specific period, it is impossible not to note that these investigations and problems of design, construction and operation of pipelines were not considered in close relationship to each other. One should not in this regard that some independent problems were solved at such a high scientific level that they now have unsurpassable scientific and practical value. But nevertheless all these investigations were not combined with each other by the community of the general goal, which has long been known and is formalized extremely simply: a specific amount of product (oil, gas, petroleum product, coal and so on) must be moved by pipeline from point A to point B. But point A may be located on the Yamal Peninsula while point B may be located on the western border of the USSR. There is no need to explain what complex problems must be solved in order for the product from point A to be delivered to point B and so that it arrives there continuously over a period of many years.

Problems arise at the second step of selecting the route: how to connect points A and B, where the route passes, what it intersects, where it cannot be laid for some reasons not dependent on the designer, how to tie the route to an existing system of pipelines and one planned for the future and how to tie the pipe diameter, working pressure of the product, disposition of pumping stations and pumping mode, design solutions and structural and technological reliability to each other, taking into account the problem of environmental protection. It is obvious without any explanation that there is no one element of this list which would not depend in some manner on the position of the route and which would not itself have a significant effect on its position. The role of the selected pipeline route is clearly obvious from its relationship to all the elements without exception that guarantee achievement of the main goal--delivery of the product to the final destination and prolonged functioning of the pipeline. The following questions immediately arise: with what expenditures of material resources and within what deadline will the given goal be achieved, what loss will be inflicted on nature and how will it be reduced. The simplest answer to these questions is that everything should be minimal: both expenditures for construction and the loss inflicted on nature and the time of construction.

A considerable volume of scientific investigations has been conducted during the past decade on selection of the optimum route. Optimum decisions on reduced expenditures, capital investments, design arrangements, branches and pumping techniques have been found and tens of computer programs have been compiled.

Thus, let us assume that we have a pipeline that is best in all respects or at least in some indicator. What does "best" or "optimum" mean? Let us present only a brief list of the interconnected (direct and feedback) elements that comprise the structural and operational structure of a pipeline (Figure

1). It is obvious from the figure that the best solution and optimization of a pipeline can be found when the highest reliability with minimum loss inflected on nature and minimum expenditures for construction and operation are achieved simultaneously. This approach to the problem of optimization of pipeline transport is still not being quite clearly followed in those investigations which have been made up to the present. This is a matter not so much of the absence of mathematical models as the absence of scientifically substantiated recommendations on solution of individual problems. Let us analyze this situation.

Pipeline

Reliability (max)

Design

Nonresolvability

Durability

Strength for p

Strength for q

Strength to special loads

Protection against corrosion

Technological

Method of Pumping

Oil

Cold, warm, hot

NS

Gas

Hot, cooled, cold, liquid

KS

Diameter and material of pipes

Uninterrupted pumping

Carrying capacity

Reduced expenditures (min)

Designs

Materials

Technology

Organization

Natural conditions

Loss to nature (min)

Interaction with Environment

Effect on nature

Methods of protection

Figure 1. Structural and Operational Structure of Pipeline

Reliability has two main branches: design and production. Design reliability is guaranteed at a given level when nondestructability and durability are guaranteed (within the limits of calculated or directive operating period). Nondestructability in turn is determined by the required design strength (for example, of pipes), calculated for test and operating pressures of the product being pumped and also to the effect of external force factors (precipitation, slides, effective flows and so on). Durability with nondestructability already guaranteed cannot be provided if prolonged effects are taken into account that reduce the carrying capacity of the structures (corrosion, shifting of pipes in soils when slip properties appear, effective loads variable in time with greater or lesser frequency).

We analyzed the investigations in the most careful manner on the strength of pipelines and concluded that it is not yet possible to talk about complete scientific substantiation of the methods of designing pipelines for strength. It is interesting to note that pipelines have an exceptionally high reserve of carrying capacity, but nevertheless they do sometimes break. This does not mean that the thickness of the pipe walls should be increased in the future. It turns out that the thickness can even be decreased by providing a test which completely determines the latent defects of a metallurgical and structural nature. One cannot assume that an increase of the thickness of pipe walls to compensate for structural and metallurgical defects is substantiated. Let us consider the optimization approach to this problem. This is the scheme of relationship of its elements: strength-conservation of metal-tests-period of introduction-time losses (and accordingly of income from later introduction into operation)-losses from accidents during operation (due to premature introduction into operation and nondetermination of latent defects)-loss to nature (sometimes unrecoverable). This is a very important direction of optimization that combines the cycle of strength, economic and ecological problems. Investigation of all the elements of this relationship also permits one to give a scientifically substantiated answer.

Let us turn to production reliability, bearing in mind only transportation of oil and gas. The main goal of guaranteeing a given level of production reliability is uninterrupted delivery of a calculated quantity of product to the final destination. There are more optimization problems here than in the case of design reliability. Let us begin with determination of the method of pumping. Discussions have been waged over a period of almost 15 years as to how best to transport gas over long distances: through pipes 1.6, 2 or 2.5 meters in diameter, without cooling, in a cooled, cold, very cold or in a liquid state and at pressure of 7.5, 10 or 12 MPa? It is interesting that the problem of optimization is sometimes very simple to solve: it is sufficient to note the formula of the area of a circle and the law of variation of gas density when its temperature and pressure vary. It is natural that the carrying capacity of a pipeline 2.5 meters in diameter is greater than that of a pipeline 1.5 meters in diameter and that more cooled (or even more so of liquid gas) can be pumped through the same pipe than hot gas. But the accompanying problems, sometimes much more complicated, arise in this case.

How does one deal with the scientific approach to the problem of selecting the optimum method of oil and gas transportation, pressure and pipe diameter. Extensive research work is being conducted in this direction at VNIIGaz [All-Union Scientific Research Institute of Natural Gas], MINKhiGP imeni I. M.

Gubkin [Moscow Institute of the Petrochemical and Gas Industry imeni Academician I. M. Gubkin], VNIIST [All-Union Scientific Research Institute for the Construction of Trunk Pipelines] and the planning institutes of Mingazprom [Ministry of the Gas Industry] and Minnefteprom [Ministry of the Petroleum Industry]. But they are sometimes conducted without the proper tie-in to design reliability and the requirements of environmental protection. And as can be seen from the figure (see Figure 1), the best solution is impossible without investigating these relationships. It is necessary in this case to constantly remember that all the elements should come together on the main basis --the route, which takes into account in the best manner their features and relationship. Available experience in theory shows that even slight changes of the location of the route lead to variation of the enumerated indicators. However, we cannot yet talk about the fact that there presently exists a scientifically substantiated methodology that permits one to state that some version of pumping, some diameter and some material are optimum under one or another natural conditions with specific material resources and capabilities of existing equipment and construction technology and the need to rearrange many sectors of the national economy when adopting an essentially new scheme (for example, transportation of liquefied gas). Let us present an example. When transporting supercooled or liquefied gas, the pipeline diameter and its carrying capacity are taken as the optimizing parameters. And all the remaining problems (heat insulation of the pipes, the technology of manufacturing them, the use of powerful cooling equipment, construction materials, the effect on nature and so on) are regarded as secondary. Just take heat insulation. An enormous number of investigations has been carried out but no prediction has been given in a single investigation of the state of heat insulation in water-saturated and periodically freezing soil, with the inevitable longitudinal and transverse shifts of the pipes that cause large force effects on the heat insulation. It is quite obvious that porous insulation cannot be used for a long time in flooded and freezing soils. However, one can talk about transportation of a cold product on the condition of solving this very problem.

One must substantiate within the shortest periods and at a high scientific level the optimum methods of pump and pipe diameters and one must tie them to selection of the route by all the remaining parameters. This will help us to answer the questions related to selection of pipe diameter.

No less complicated problems are related to construction of long oil pipelines, especially under arctic conditions: the permafrost cannot be "thawed," cold frozen oil also cannot be pumped and it is very expensive to construct a pipeline on supports. But it must be constructed. This means that the solution of this problem is one of the most important directions for optimization of pipeline construction.

The construction problems related to reduced expenditures and that are of no less importance for the efficiency of pipeline transport should be noted. The fact is that regardless of the extent to which the best solutions are optimized and are found in pure form, they are useless (although not senseless) at a given period if the existing level of construction does not permit implementation of them. The direct relationship of the elements of construction to all the elements of design and production reliability and also to problems of environmental protection arises here.

The terrain conditions over the entire length of the route are extremely diverse and it is frequently impossible to carry out construction by the design scheme which is the best one with respect to production or design reliability. This means that one must bear in mind the real capabilities of the construction subdivisions. It is probable that not every pipeline can be constructed with the high mobilization of resources and funds which occurred, for example, in construction of the Vyganpur-Chelyabinsk gas pipeline or the Surgut-Polotsk oil pipeline. Development of the optimum process flow diagrams of construction for specific natural conditions and tying them to design and production reliability and also to the requirements of environmental protection are necessary. Optimization of the organizational structures and transport schemes of construction permits one to control construction in the best manner and to maneuver the construction subdivisions so as to contribute to achievement of high rates of construction and reduction of deadlines.

It is impossible not to note once again such a problem of pipeline construction as environmental protection. This section of optimization of pipeline transport is found essentially only at the stage of establishment. Optimization should primarily envision the direction of the route, design of the pipeline and pumping technology that inflict minimum losses on nature. This can be achieved by having a clear classification of the effects on nature during transportation and storage of oil and gas and the methods of predicting changes in the state of nature during prolonged operation of pipeline transport facilities. This classification is being worked out at MINKhiGP imeni I. M. Gubkin, VNIIGaz, VNIIST and at other institutes. Investigations are being conducted on predicting the effects on nature and a complex of measures is being worked out to reduce their effect on the natural vegetation complex, the animal world and reservoirs. The first results already show the capability and feasibility of combining problems of environmental protection to development of designs, pumping techniques and the technology and organization of pipeline construction.

It is obvious from the foregoing how complex and interrelated the problems of pipeline transport of oil and gas are. It is the complex approach that permits one to solve in the best manner those problems which are related to the need for a continuous guarantee of the country's industrial regions with oil and gas from fields located in the vast territory of the Arctic and Western and Eastern Siberia.

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